



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 16, 2024 – 06:17 PM JST

PDB ID : 8HJ8
Title : Crystal structure of barley exohydrolase isoform ExoI E220A mutant in complex with 2-deoxy-2-fluoro-D-glucopyranosides
Authors : Luang, S.; Streltsov, V.A.; Hrmova, M.
Deposited on : 2022-11-22
Resolution : 1.95 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtrriage (Phenix) : 1.21
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.004 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.40

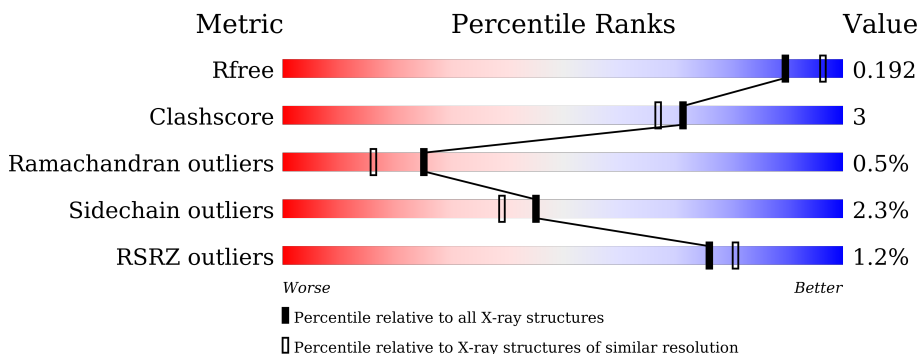
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

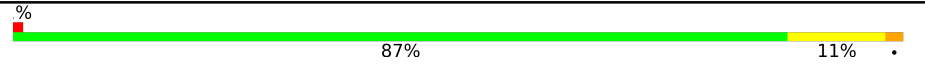
The reported resolution of this entry is 1.95 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	3187 (1.96-1.96)
Clashscore	180529	3412 (1.96-1.96)
Ramachandran outliers	177936	3390 (1.96-1.96)
Sidechain outliers	177891	3390 (1.96-1.96)
RSRZ outliers	164620	3186 (1.96-1.96)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	609	

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 5400 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

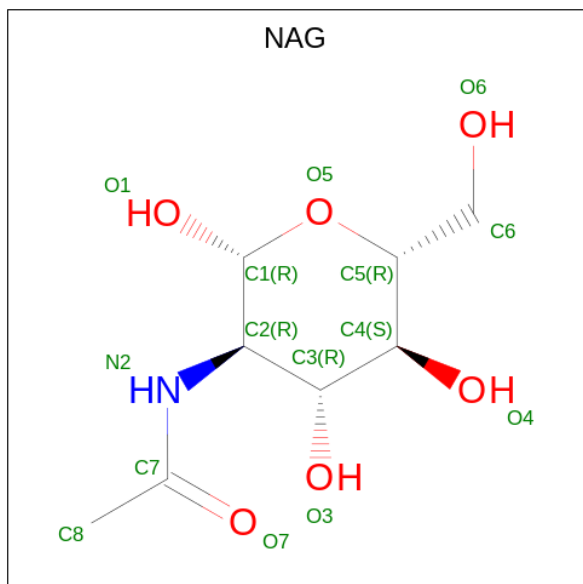
- Molecule 1 is a protein called Glyco_hydro_3 domain-containing protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	606	4617	2918	802	868	29	0	14	0

There are 5 discrepancies between the modelled and reference sequences:

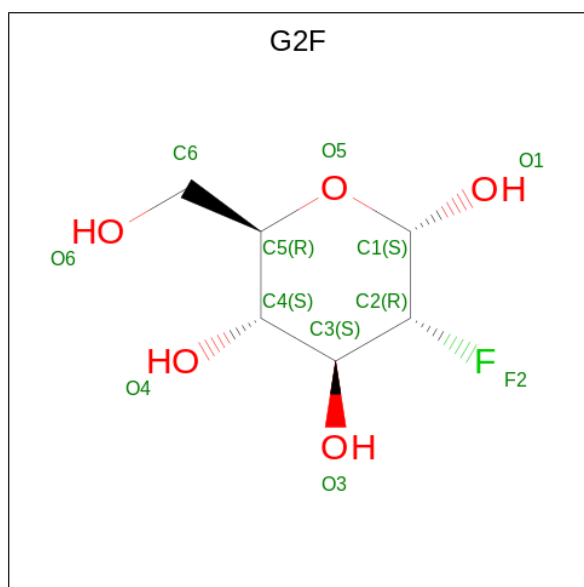
Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	HIS	-	expression tag	UNP A0A8I6XKI1
A	-2	HIS	-	expression tag	UNP A0A8I6XKI1
A	-1	ALA	-	expression tag	UNP A0A8I6XKI1
A	220	ALA	GLU	engineered mutation	UNP A0A8I6XKI1
A	320	LYS	ASN	conflict	UNP A0A8I6XKI1

- Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$) (labeled as "Ligand of Interest" by depositor).



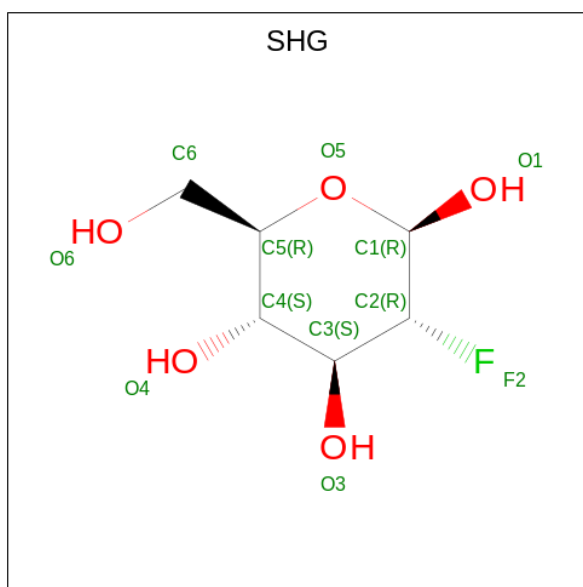
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 3 is 2-deoxy-2-fluoro-alpha-D-glucopyranose (three-letter code: G2F) (formula: $C_6H_{11}FO_5$) (labeled as "Ligand of Interest" by depositor).



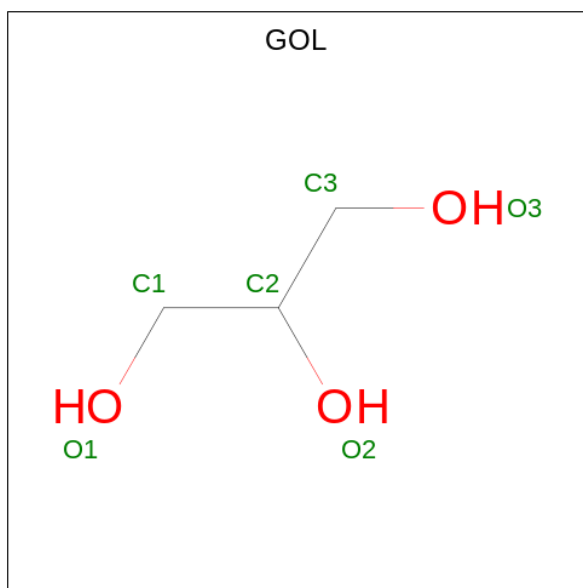
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	F	O	0	0
			11	6	1	4		

- Molecule 4 is 2-deoxy-2-fluoro-beta-D-glucopyranose (three-letter code: SHG) (formula: $C_6H_{11}FO_5$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	F	O		
4	A	1	12	6	1	5	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



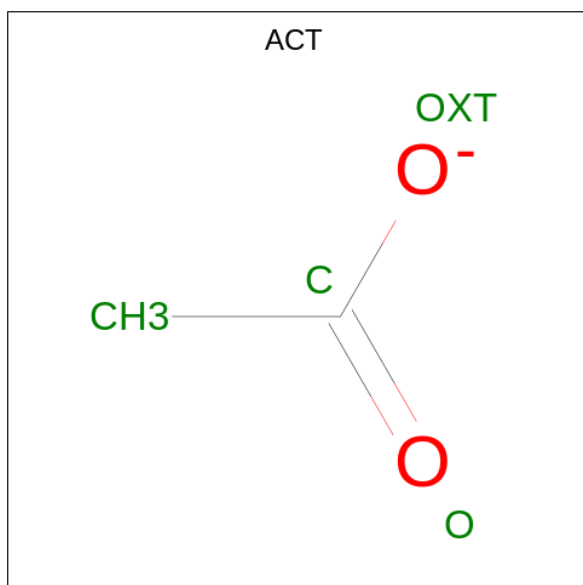
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	A	1	6	3	3	0	0
5	A	1	6	3	3	0	0
5	A	1	6	3	3	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			6	3	3		
5	A	1	Total	C	O	0	0
			6	3	3		

- Molecule 6 is ACETATE ION (three-letter code: ACT) (formula: C₂H₃O₂).



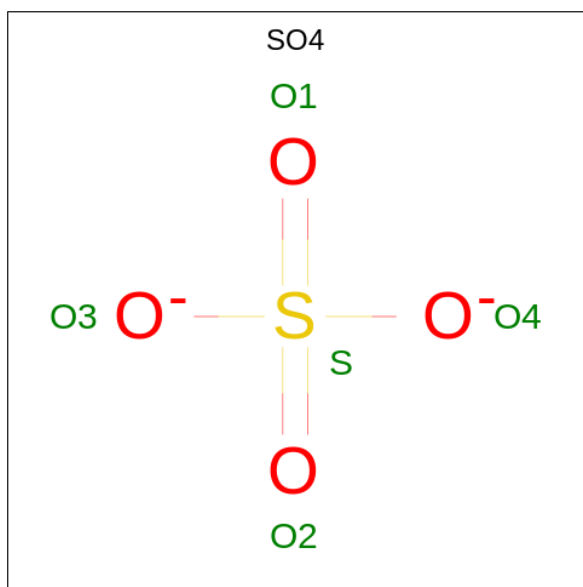
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 4 2 2	0	0
6	A	1	Total C O 4 2 2	0	0

- Molecule 7 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total O S 5 4 1	0	0
7	A	1	Total O S 5 4 1	0	0
7	A	1	Total O S 5 4 1	0	0

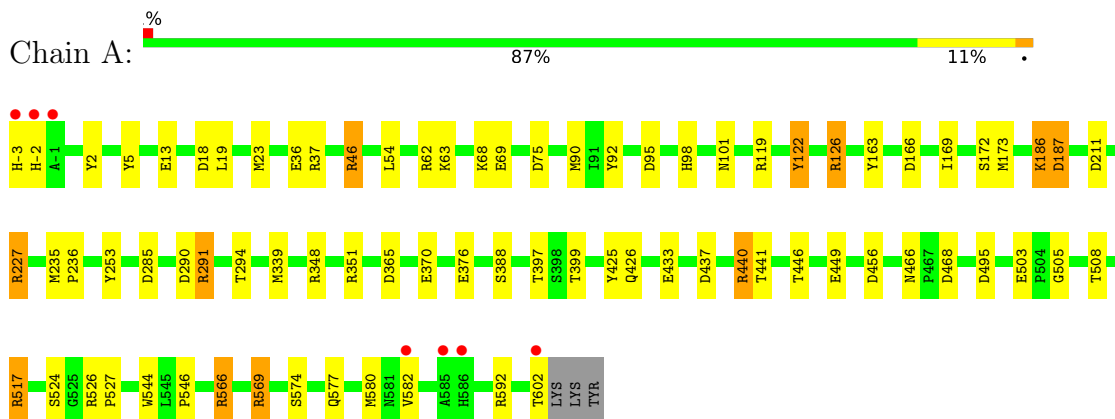
- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	629	Total O 629 629	0	0

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: Glyco_hydro_3 domain-containing protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	100.50Å 100.50Å 182.69Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	88.06 – 1.95 88.06 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.3 (88.06-1.95) 99.3 (88.06-1.95)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.66 (at 1.95Å)	Xtrriage
Refinement program	REFMAC 7.0.005	Depositor
R, R_{free}	0.144 , 0.184 0.158 , 0.192	Depositor DCC
R_{free} test set	3473 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	34.4	Xtrriage
Anisotropy	0.035	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 49.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	5400	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.97% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality i

5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, G2F, ACT, SO4, SHG, NAG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	1.44	26/4769 (0.5%)	1.37	56/6474 (0.9%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	503	GLU	CD-OE2	13.09	1.40	1.25
1	A	517[B]	ARG	CZ-NH1	9.09	1.44	1.33
1	A	440[A]	ARG	CZ-NH2	7.67	1.43	1.33
1	A	440[A]	ARG	CZ-NH1	7.34	1.42	1.33
1	A	13	GLU	CD-OE1	6.25	1.32	1.25
1	A	126	ARG	CD-NE	-6.13	1.36	1.46
1	A	574	SER	CA-CB	5.95	1.61	1.52
1	A	122	TYR	CG-CD2	5.94	1.46	1.39
1	A	69	GLU	CD-OE2	5.93	1.32	1.25
1	A	592	ARG	NE-CZ	5.90	1.40	1.33
1	A	592	ARG	CZ-NH2	5.89	1.40	1.33
1	A	253	TYR	CZ-OH	5.78	1.47	1.37
1	A	503	GLU	CG-CD	5.78	1.60	1.51
1	A	172	SER	CB-OG	5.75	1.49	1.42
1	A	517[B]	ARG	CG-CD	5.73	1.66	1.51
1	A	163	TYR	CG-CD1	5.71	1.46	1.39
1	A	388	SER	CB-OG	5.66	1.49	1.42
1	A	426	GLN	CB-CG	-5.47	1.37	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	546	PRO	N-CA	5.39	1.56	1.47
1	A	433	GLU	CD-OE2	-5.36	1.19	1.25
1	A	370	GLU	CD-OE2	-5.36	1.19	1.25
1	A	446	THR	CB-OG1	5.26	1.53	1.43
1	A	370	GLU	CG-CD	5.25	1.59	1.51
1	A	37	ARG	CZ-NH2	5.13	1.39	1.33
1	A	2	TYR	CE1-CZ	5.12	1.45	1.38
1	A	5	TYR	CG-CD1	5.08	1.45	1.39

All (56) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	126	ARG	NE-CZ-NH1	22.11	131.36	120.30
1	A	126	ARG	NE-CZ-NH2	-18.33	111.13	120.30
1	A	517[B]	ARG	NE-CZ-NH1	11.87	126.23	120.30
1	A	46	ARG	NE-CZ-NH2	11.78	126.19	120.30
1	A	62	ARG	NE-CZ-NH2	-11.70	114.45	120.30
1	A	592	ARG	NE-CZ-NH2	11.10	125.85	120.30
1	A	440[A]	ARG	NE-CZ-NH2	-10.99	114.81	120.30
1	A	566[A]	ARG	CG-CD-NE	10.65	134.16	111.80
1	A	566[B]	ARG	CG-CD-NE	10.65	134.16	111.80
1	A	351	ARG	NE-CZ-NH1	10.30	125.45	120.30
1	A	517[B]	ARG	NE-CZ-NH2	-9.92	115.34	120.30
1	A	18	ASP	CB-CG-OD2	9.86	127.17	118.30
1	A	456	ASP	CB-CG-OD1	9.66	126.99	118.30
1	A	456	ASP	CB-CG-OD2	-9.61	109.65	118.30
1	A	291	ARG	NE-CZ-NH1	-8.58	116.01	120.30
1	A	75	ASP	CB-CG-OD2	-8.34	110.80	118.30
1	A	291	ARG	NE-CZ-NH2	7.98	124.29	120.30
1	A	166	ASP	CB-CG-OD2	-7.64	111.42	118.30
1	A	227[A]	ARG	NE-CZ-NH1	7.51	124.06	120.30
1	A	227[B]	ARG	NE-CZ-NH1	7.51	124.06	120.30
1	A	18	ASP	CB-CG-OD1	-7.40	111.64	118.30
1	A	351	ARG	NE-CZ-NH2	-7.36	116.62	120.30
1	A	46	ARG	NE-CZ-NH1	-7.20	116.70	120.30
1	A	449	GLU	OE1-CD-OE2	-7.19	114.67	123.30
1	A	285	ASP	CB-CG-OD2	-7.16	111.86	118.30
1	A	166	ASP	CB-CG-OD1	7.13	124.72	118.30
1	A	376[A]	GLU	OE1-CD-OE2	-7.04	114.86	123.30
1	A	376[B]	GLU	OE1-CD-OE2	-7.04	114.86	123.30
1	A	119	ARG	NE-CZ-NH2	-6.90	116.85	120.30
1	A	211	ASP	CB-CG-OD1	6.62	124.25	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	126	ARG	CD-NE-CZ	6.37	132.51	123.60
1	A	119	ARG	NE-CZ-NH1	6.34	123.47	120.30
1	A	440[A]	ARG	NE-CZ-NH1	6.23	123.42	120.30
1	A	440[A]	ARG	CG-CD-NE	-6.21	98.76	111.80
1	A	285	ASP	CB-CG-OD1	6.01	123.71	118.30
1	A	566[A]	ARG	NE-CZ-NH1	5.95	123.28	120.30
1	A	566[B]	ARG	NE-CZ-NH1	5.95	123.28	120.30
1	A	468	ASP	CB-CG-OD1	5.89	123.60	118.30
1	A	440[A]	ARG	CD-NE-CZ	5.85	131.79	123.60
1	A	348	ARG	NE-CZ-NH1	5.63	123.12	120.30
1	A	526	ARG	NE-CZ-NH1	5.63	123.11	120.30
1	A	95	ASP	CB-CG-OD1	-5.52	113.33	118.30
1	A	495	ASP	CB-CG-OD1	5.51	123.26	118.30
1	A	526	ARG	NE-CZ-NH2	-5.45	117.58	120.30
1	A	46	ARG	CD-NE-CZ	5.45	131.23	123.60
1	A	62	ARG	NE-CZ-NH1	5.43	123.02	120.30
1	A	569	ARG	CB-CA-C	-5.39	99.61	110.40
1	A	365	ASP	CB-CG-OD2	-5.23	113.59	118.30
1	A	227[A]	ARG	CG-CD-NE	5.22	122.76	111.80
1	A	227[B]	ARG	CG-CD-NE	5.22	122.76	111.80
1	A	92	TYR	CB-CG-CD1	5.18	124.11	121.00
1	A	68	LYS	CD-CE-NZ	5.18	123.61	111.70
1	A	425	TYR	CB-CG-CD2	-5.10	117.94	121.00
1	A	376[A]	GLU	CG-CD-OE1	5.06	128.43	118.30
1	A	376[B]	GLU	CG-CD-OE1	5.06	128.43	118.30
1	A	569	ARG	NE-CZ-NH2	-5.00	117.80	120.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	-3	HIS	Peptide
1	A	187	ASP	Peptide

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4617	0	4570	24	0
2	A	42	0	39	0	0
3	A	11	0	9	0	0
4	A	12	0	11	2	0
5	A	30	0	40	1	0
6	A	44	0	33	4	0
7	A	15	0	0	0	0
8	A	629	0	0	14	0
All	All	5400	0	4702	30	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (30) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:A:709:GOL:H32	8:A:806:HOH:O	1.64	0.96
1:A:122:TYR:CE2	1:A:126:ARG:HD2	2.16	0.80
1:A:399:THR:HG23	8:A:923:HOH:O	1.87	0.74
1:A:466[A]:ASN:OD1	1:A:508:THR:OG1	2.08	0.71
1:A:566[B]:ARG:CZ	8:A:806:HOH:O	2.47	0.61
4:A:705:SHG:H6A	8:A:1260:HOH:O	2.04	0.58
1:A:517[B]:ARG:HG2	8:A:1226:HOH:O	2.04	0.56
4:A:705:SHG:H6	8:A:1293:HOH:O	2.07	0.55
1:A:291:ARG:HD3	8:A:1075:HOH:O	2.09	0.53
1:A:227[B]:ARG:NH1	8:A:805:HOH:O	2.24	0.51
1:A:577:GLN:HB3	1:A:580[B]:MET:SD	2.52	0.50
1:A:294:THR:HG23	6:A:715:ACT:OXT	2.13	0.49
6:A:713:ACT:CH3	8:A:1389:HOH:O	2.60	0.48
1:A:46:ARG:HD2	8:A:1038:HOH:O	2.13	0.47
1:A:397:THR:OG1	1:A:399:THR:HG22	2.14	0.47
1:A:235:MET:N	1:A:236:PRO:CD	2.77	0.47
1:A:566[B]:ARG:NE	8:A:806:HOH:O	2.47	0.47
1:A:122:TYR:CZ	1:A:126:ARG:HD2	2.50	0.46
1:A:339[B]:MET:HG2	8:A:1312:HOH:O	2.16	0.45
6:A:718:ACT:H3	8:A:1376:HOH:O	2.16	0.44
1:A:19:LEU:O	1:A:23:MET:HG3	2.17	0.44
1:A:527:PRO:HD3	1:A:569:ARG:HD3	2.00	0.44
1:A:524:SER:O	1:A:544:TRP:HA	2.19	0.43
1:A:122:TYR:CD2	1:A:126:ARG:HD2	2.55	0.42
1:A:169:ILE:O	1:A:173[A]:MET:HG2	2.19	0.41
1:A:122:TYR:O	1:A:126:ARG:HD3	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:437:ASP:HB3	1:A:441:THR:HG21	2.03	0.41
6:A:719:ACT:H2	8:A:807:HOH:O	2.21	0.41

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	613/609 (101%)	588 (96%)	22 (4%)	3 (0%)	25 16

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	-2	HIS
1	A	505	GLY
1	A	582	VAL

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	495/489 (101%)	484 (98%)	11 (2%)	47 41

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	36	GLU
1	A	54	LEU
1	A	63	LYS
1	A	90	MET
1	A	98	HIS
1	A	101	ASN
1	A	186[A]	LYS
1	A	187	ASP
1	A	290	ASP
1	A	440[A]	ARG
1	A	602	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

24 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
6	ACT	A	721	-	3,3,3	1.05	0	3,3,3	0.17	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	ACT	A	718	-	3,3,3	1.00	0	3,3,3	2.26	2 (66%)
6	ACT	A	715	-	3,3,3	0.84	0	3,3,3	0.97	0
6	ACT	A	719	-	3,3,3	0.76	0	3,3,3	0.87	0
6	ACT	A	712	-	3,3,3	1.03	0	3,3,3	1.11	0
6	ACT	A	711	-	3,3,3	1.00	0	3,3,3	0.65	0
6	ACT	A	713	-	3,3,3	0.71	0	3,3,3	1.31	0
7	SO4	A	723	-	4,4,4	0.52	0	6,6,6	0.46	0
3	G2F	A	704	-	11,11,12	2.10	4 (36%)	10,15,17	1.29	1 (10%)
2	NAG	A	702	1	14,14,15	1.94	2 (14%)	17,19,21	3.09	4 (23%)
5	GOL	A	707	-	5,5,5	0.55	0	5,5,5	0.93	0
2	NAG	A	701	1	14,14,15	0.89	0	17,19,21	2.44	8 (47%)
5	GOL	A	710	-	5,5,5	0.49	0	5,5,5	1.01	0
4	SHG	A	705	-	12,12,12	3.06	5 (41%)	16,17,17	3.54	8 (50%)
5	GOL	A	709	-	5,5,5	0.58	0	5,5,5	0.68	0
6	ACT	A	716	-	3,3,3	0.62	0	3,3,3	1.51	0
6	ACT	A	720	-	3,3,3	0.84	0	3,3,3	0.61	0
5	GOL	A	706	-	5,5,5	0.34	0	5,5,5	1.14	1 (20%)
5	GOL	A	708	-	5,5,5	0.68	0	5,5,5	1.12	1 (20%)
6	ACT	A	717	-	3,3,3	0.84	0	3,3,3	0.35	0
6	ACT	A	714	-	3,3,3	0.72	0	3,3,3	1.45	1 (33%)
7	SO4	A	724	-	4,4,4	0.53	0	6,6,6	0.38	0
2	NAG	A	703	1	14,14,15	0.78	0	17,19,21	1.42	4 (23%)
7	SO4	A	722	-	4,4,4	0.88	0	6,6,6	1.15	1 (16%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	A	702	1	-	2/6/23/26	0/1/1/1
5	GOL	A	706	-	-	3/4/4/4	-
5	GOL	A	707	-	-	4/4/4/4	-
5	GOL	A	708	-	-	2/4/4/4	-
2	NAG	A	701	1	-	0/6/23/26	0/1/1/1
4	SHG	A	705	-	-	2/2/22/22	0/1/1/1
2	NAG	A	703	1	-	0/6/23/26	0/1/1/1
5	GOL	A	710	-	-	0/4/4/4	-
3	G2F	A	704	-	-	0/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	GOL	A	709	-	-	1/4/4/4	-

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	705	SHG	C2-C1	6.33	1.58	1.52
4	A	705	SHG	C2-C3	5.57	1.57	1.52
3	A	704	G2F	C1-C2	4.89	1.59	1.52
2	A	702	NAG	C1-C2	4.70	1.59	1.52
4	A	705	SHG	O1-C1	4.47	1.53	1.39
2	A	702	NAG	O5-C1	4.40	1.50	1.43
4	A	705	SHG	O5-C1	3.02	1.50	1.42
3	A	704	G2F	C2-C3	2.78	1.55	1.51
3	A	704	G2F	O3-C3	2.61	1.49	1.43
3	A	704	G2F	O5-C5	2.55	1.48	1.43
4	A	705	SHG	O3-C3	2.37	1.48	1.43

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	702	NAG	C1-O5-C5	8.09	123.16	112.19
4	A	705	SHG	C1-O5-C5	8.03	128.82	113.66
4	A	705	SHG	O3-C3-C2	7.22	124.00	109.68
2	A	702	NAG	O5-C5-C6	7.20	118.48	107.20
4	A	705	SHG	F2-C2-C1	6.35	114.79	107.77
2	A	701	NAG	C1-C2-N2	4.75	118.60	110.49
2	A	701	NAG	C4-C3-C2	-4.39	104.58	111.02
2	A	702	NAG	O5-C1-C2	-4.34	104.44	111.29
2	A	701	NAG	O5-C5-C4	-3.47	102.40	110.83
2	A	701	NAG	O5-C5-C6	3.46	112.63	107.20
4	A	705	SHG	O1-C1-C2	3.22	123.12	109.36
3	A	704	G2F	O3-C3-C2	3.07	115.42	109.58
6	A	718	ACT	O-C-CH3	-3.05	110.47	122.33
2	A	702	NAG	C3-C4-C5	-2.89	105.08	110.24
2	A	701	NAG	C6-C5-C4	2.72	119.37	113.00
4	A	705	SHG	O5-C5-C6	2.66	113.06	106.44
2	A	703	NAG	O5-C1-C2	-2.66	107.09	111.29
4	A	705	SHG	C3-C4-C5	-2.38	105.99	110.24
2	A	703	NAG	O5-C5-C6	2.38	110.94	107.20
5	A	706	GOL	C3-C2-C1	-2.38	102.47	111.70
2	A	701	NAG	C3-C4-C5	-2.35	106.04	110.24
6	A	718	ACT	OXT-C-CH3	2.34	124.87	115.18

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	705	SHG	F2-C2-C3	2.31	110.90	108.85
2	A	701	NAG	O4-C4-C5	2.26	114.92	109.30
7	A	722	SO4	O4-S-O2	2.25	121.03	109.31
2	A	701	NAG	O7-C7-C8	-2.14	118.08	122.06
4	A	705	SHG	C6-C5-C4	2.13	118.00	113.00
2	A	703	NAG	O5-C5-C4	-2.05	105.84	110.83
5	A	708	GOL	O1-C1-C2	2.03	119.96	110.20
2	A	703	NAG	O4-C4-C5	2.03	114.33	109.30
6	A	714	ACT	OXT-C-CH3	2.01	123.47	115.18

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	706	GOL	O1-C1-C2-O2
5	A	707	GOL	C1-C2-C3-O3
5	A	707	GOL	O2-C2-C3-O3
5	A	708	GOL	C1-C2-C3-O3
4	A	705	SHG	O5-C5-C6-O6
4	A	705	SHG	C4-C5-C6-O6
2	A	702	NAG	C4-C5-C6-O6
5	A	706	GOL	O1-C1-C2-C3
5	A	707	GOL	O1-C1-C2-C3
5	A	709	GOL	O1-C1-C2-C3
2	A	702	NAG	O5-C5-C6-O6
5	A	708	GOL	O2-C2-C3-O3
5	A	707	GOL	O1-C1-C2-O2
5	A	706	GOL	C1-C2-C3-O3

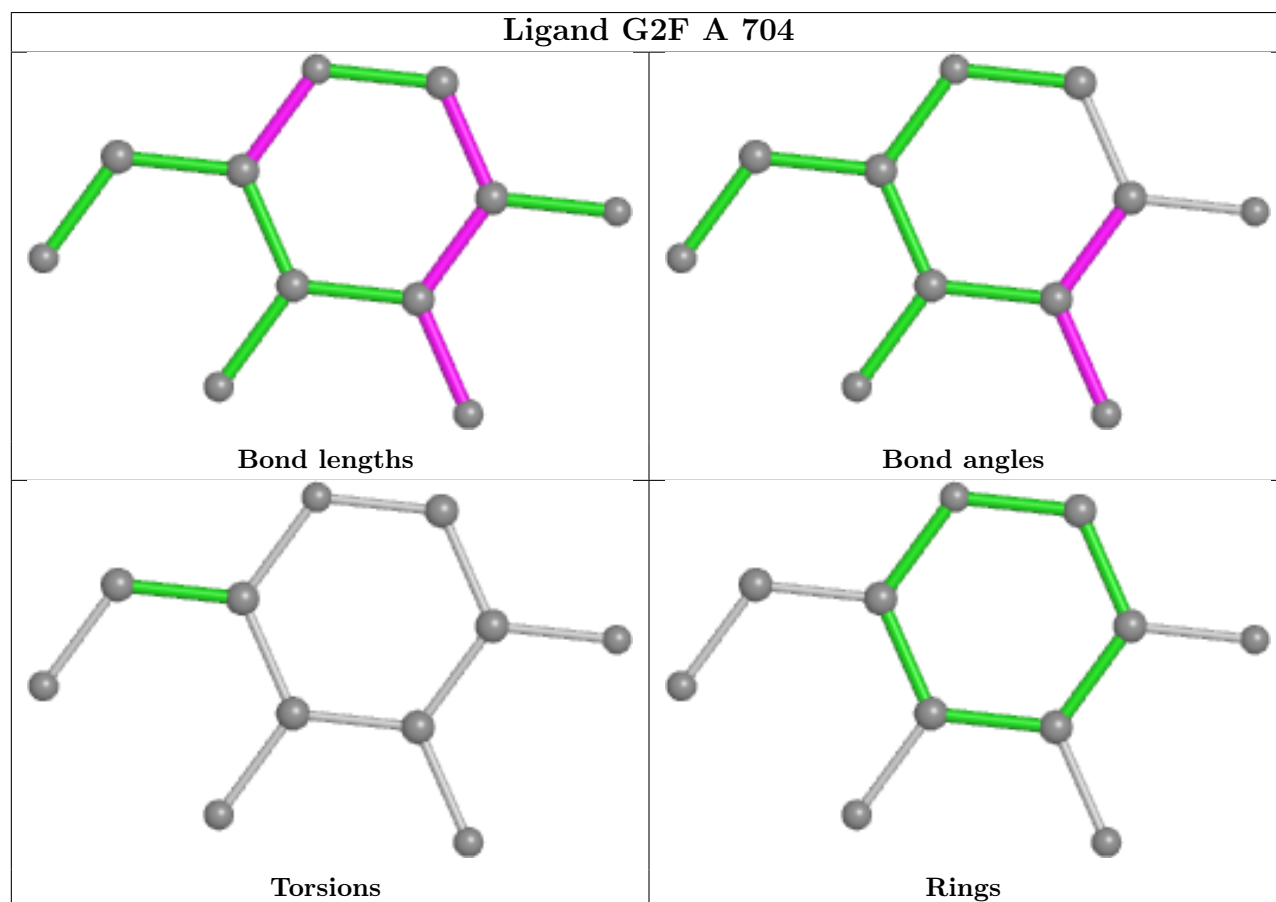
There are no ring outliers.

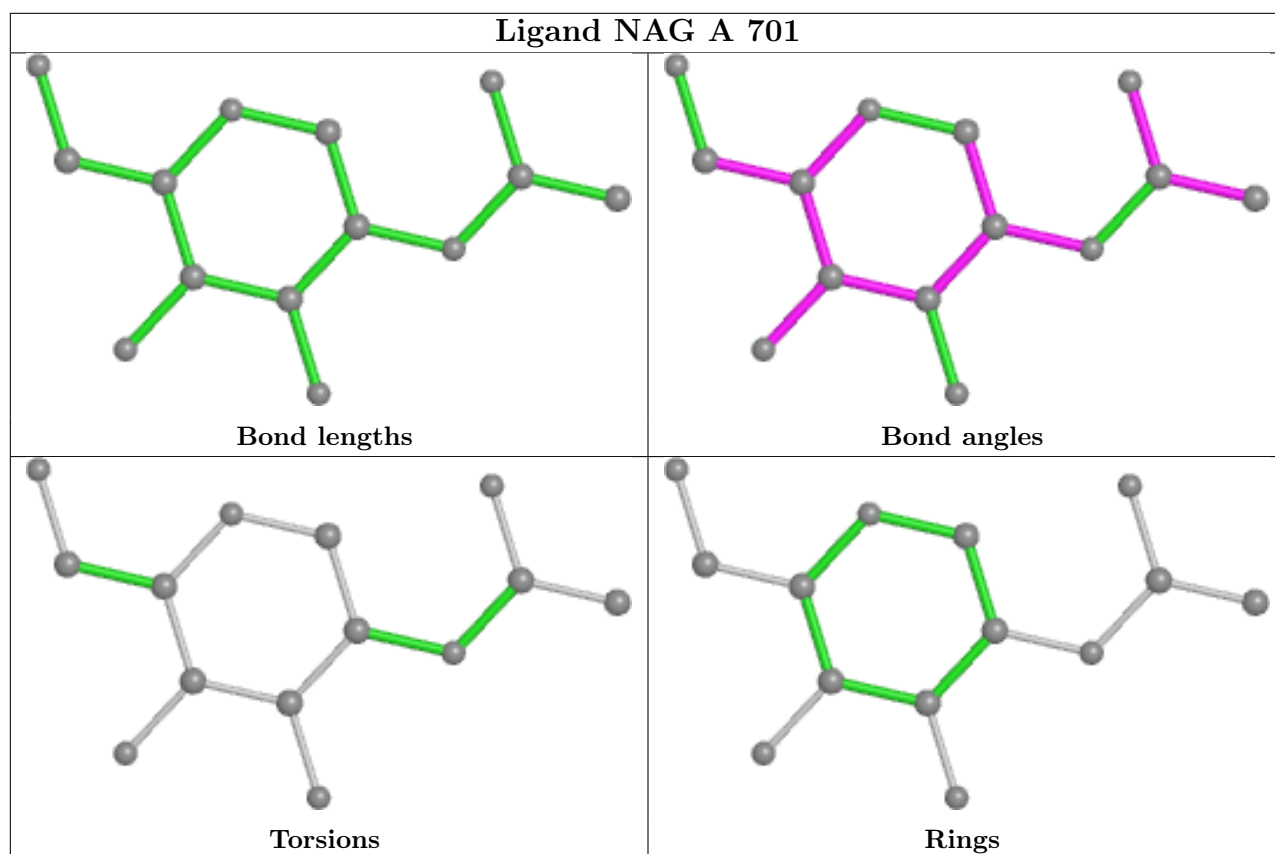
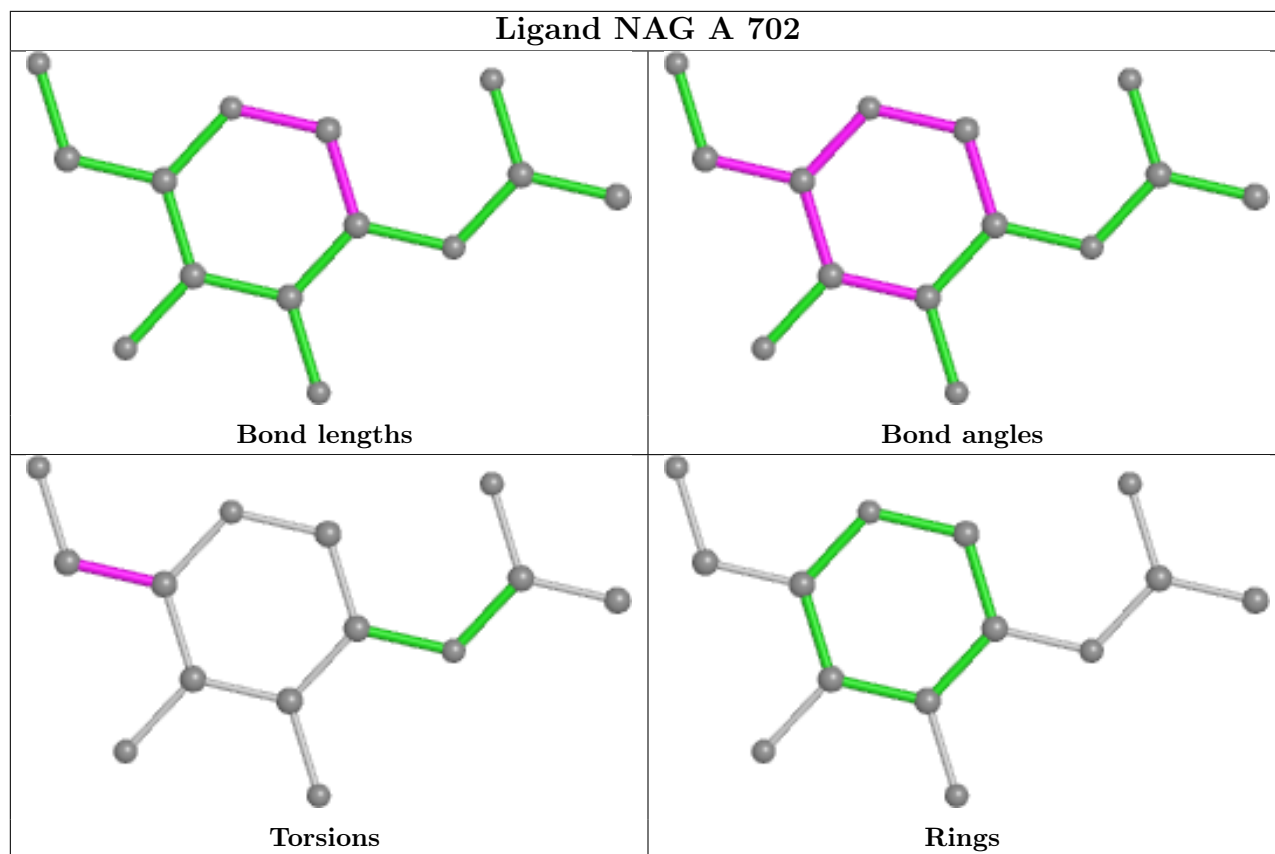
6 monomers are involved in 7 short contacts:

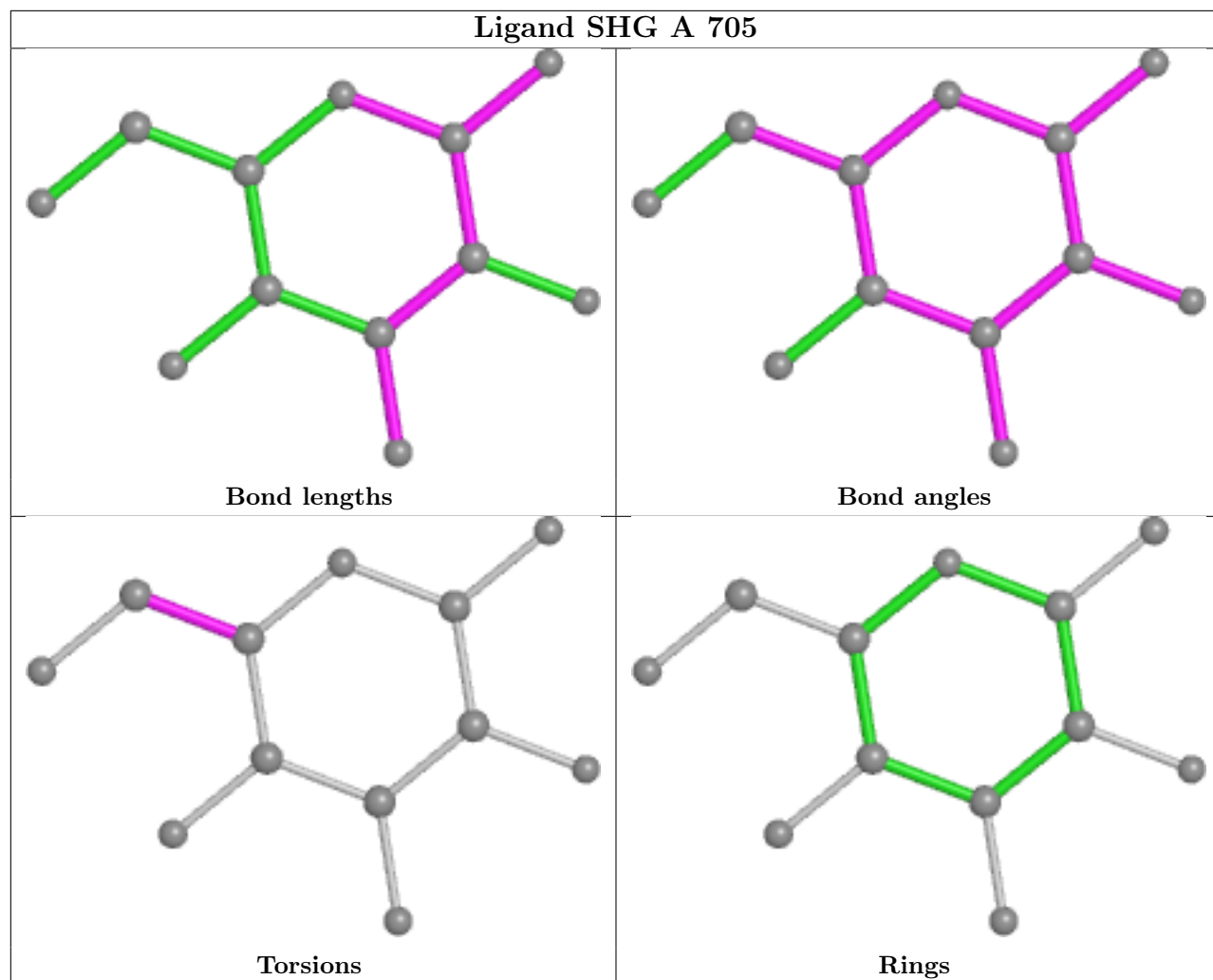
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	718	ACT	1	0
6	A	715	ACT	1	0
6	A	719	ACT	1	0
6	A	713	ACT	1	0
4	A	705	SHG	2	0
5	A	709	GOL	1	0

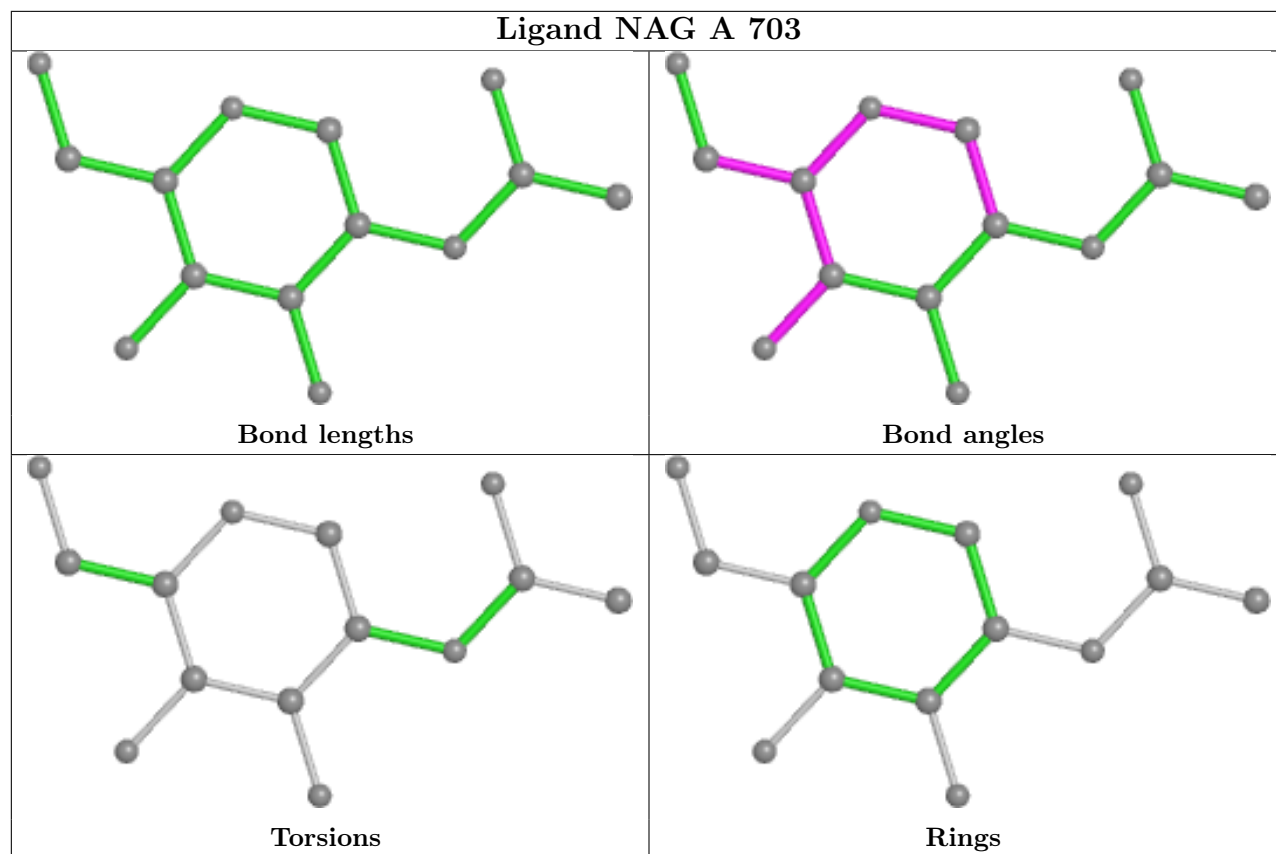
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled '#RSRZ > 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q < 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	606/609 (99%)	-0.35	7 (1%) 76 81	24, 34, 51, 106	8 (1%)

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	586	HIS	3.7
1	A	-2	HIS	3.5
1	A	582	VAL	3.5
1	A	602	THR	3.5
1	A	-3	HIS	3.2
1	A	-1	ALA	3.0
1	A	585	ALA	2.3

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	ACT	A	712	4/4	0.56	0.28	61,76,86,89	0

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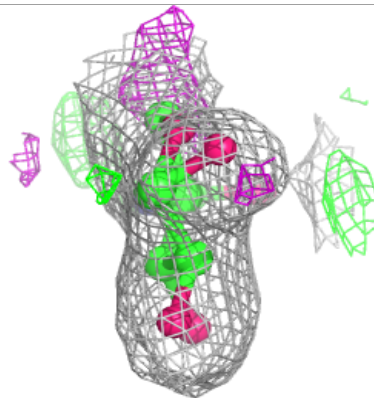
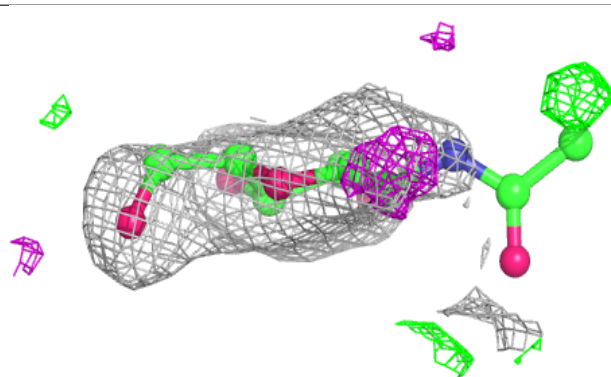
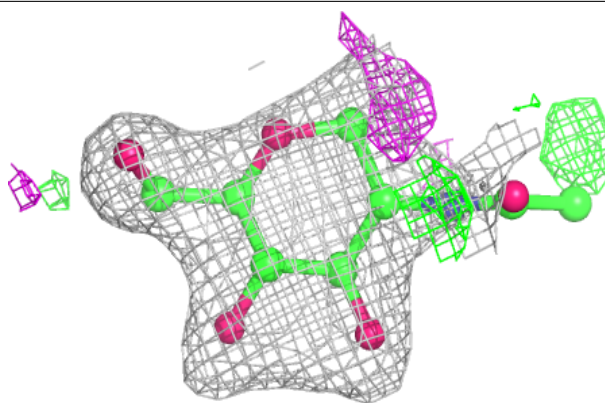
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
7	SO4	A	723	5/5	0.63	0.11	99,106,112,120	0
6	ACT	A	720	4/4	0.71	0.21	72,83,87,88	0
6	ACT	A	717	4/4	0.74	0.20	66,76,76,81	0
6	ACT	A	719	4/4	0.74	0.16	63,74,75,79	0
2	NAG	A	702	14/15	0.75	0.14	58,87,102,106	0
2	NAG	A	701	14/15	0.76	0.14	78,90,94,97	0
7	SO4	A	724	5/5	0.76	0.13	85,107,127,127	0
5	GOL	A	709	6/6	0.80	0.15	65,71,80,81	0
6	ACT	A	711	4/4	0.81	0.15	64,74,75,79	0
6	ACT	A	713	4/4	0.82	0.14	48,60,63,66	0
6	ACT	A	714	4/4	0.83	0.15	64,70,71,74	0
6	ACT	A	718	4/4	0.85	0.19	35,51,57,58	0
6	ACT	A	721	4/4	0.85	0.21	73,73,81,84	0
6	ACT	A	715	4/4	0.87	0.15	66,69,70,72	0
4	SHG	A	705	12/12	0.88	0.11	38,47,53,55	0
6	ACT	A	716	4/4	0.88	0.17	60,63,67,75	0
2	NAG	A	703	14/15	0.88	0.11	52,57,83,90	0
5	GOL	A	708	6/6	0.89	0.13	43,57,67,89	0
5	GOL	A	706	6/6	0.89	0.22	37,41,44,51	6
5	GOL	A	707	6/6	0.89	0.18	51,74,81,96	0
5	GOL	A	710	6/6	0.90	0.12	64,69,72,75	0
7	SO4	A	722	5/5	0.93	0.07	49,50,66,68	0
3	G2F	A	704	11/12	0.95	0.08	30,34,39,40	0

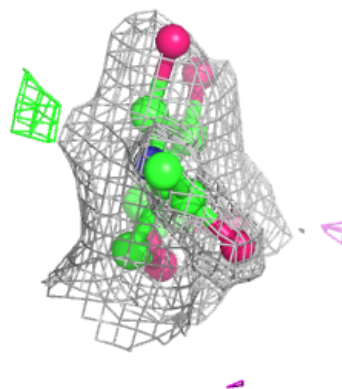
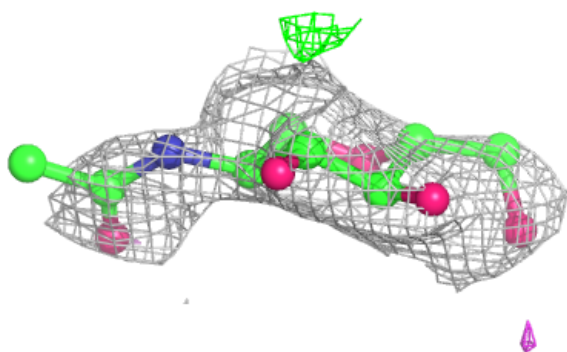
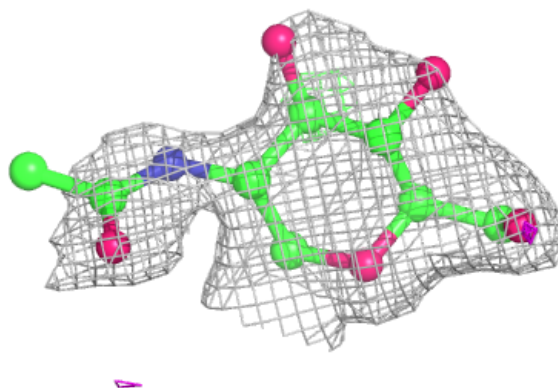
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

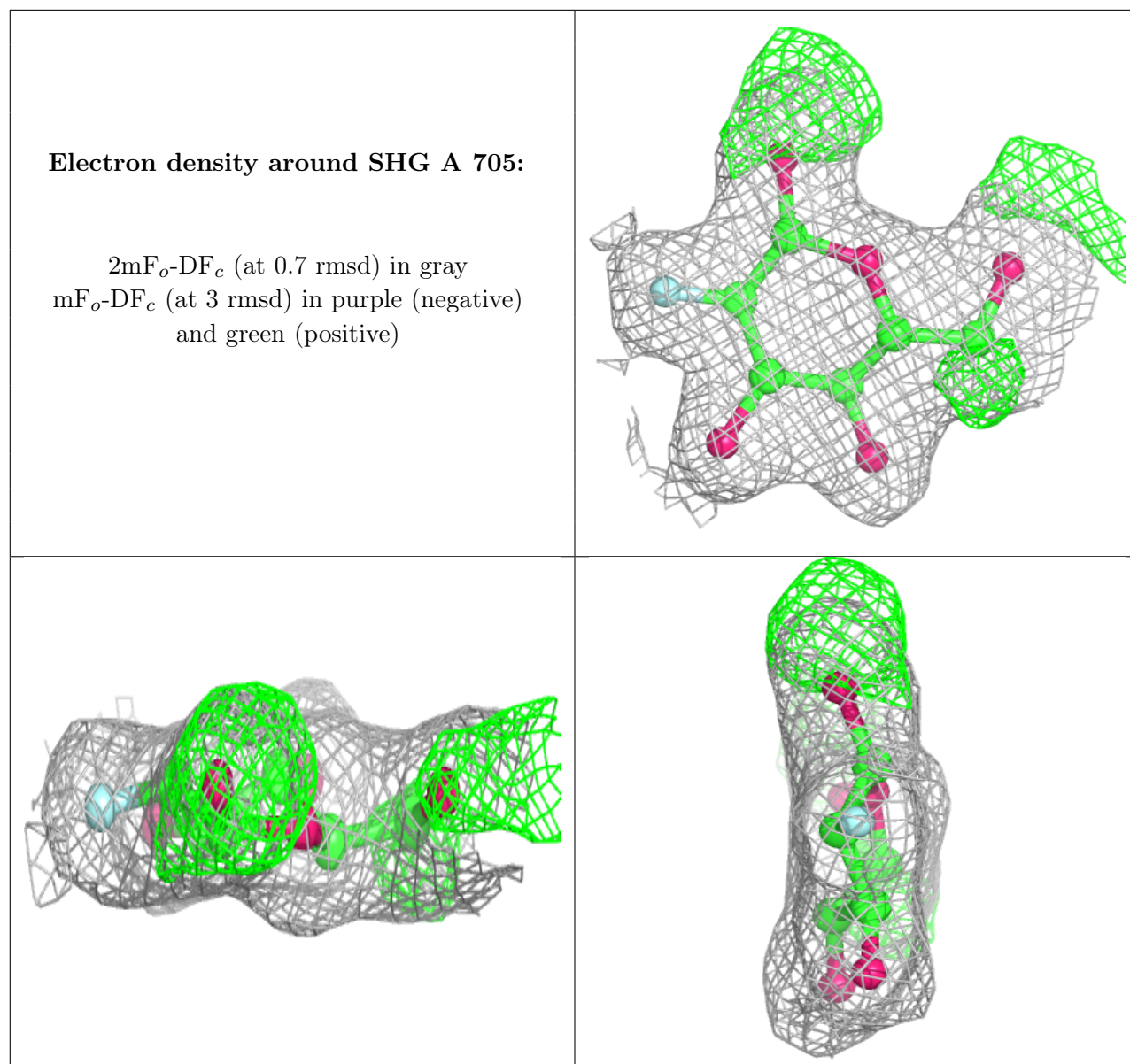
Electron density around NAG A 702:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around NAG A 701:**

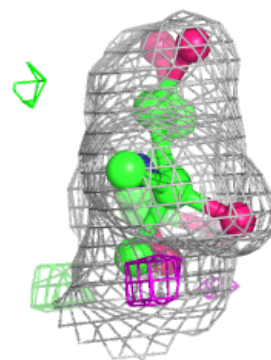
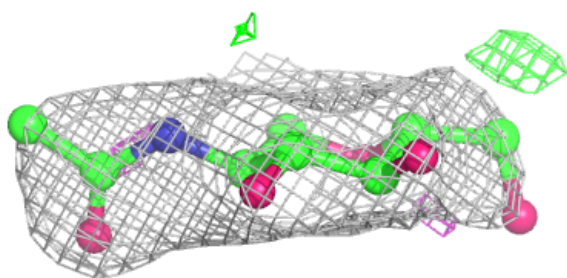
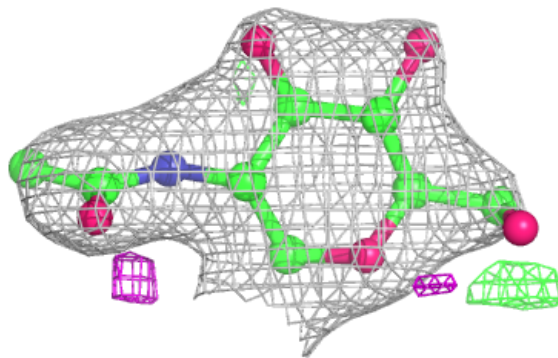
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





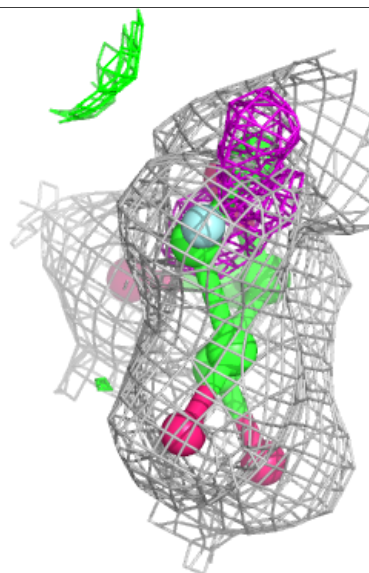
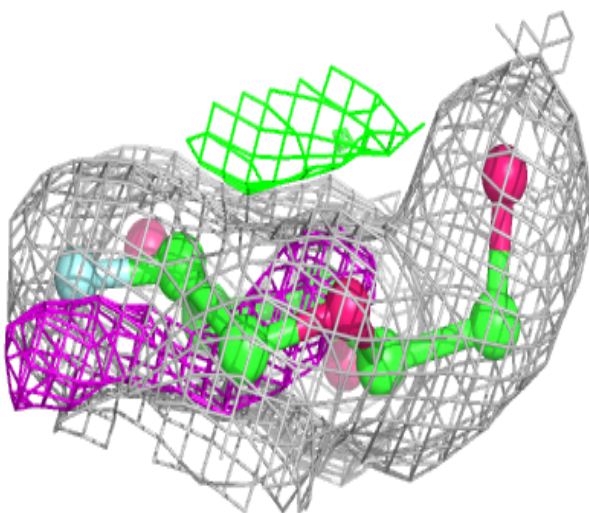
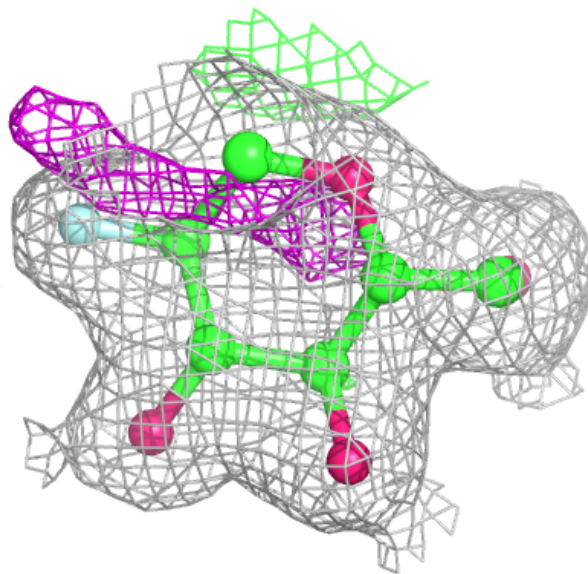
Electron density around NAG A 703:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around G2F A 704:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.